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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/168,770	10/08/1998	RASHMI K. SHAH	TH-1042(US)	2851

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EXAMINER
RIDLEY, BASIA ANNA

ART UNIT	PAPER NUMBER
1764	28

DATE MAILED: 01/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/168,770	Applicant(s) SHAH ET AL.	
	Examiner Basia Ridley	Art Unit 1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 August 2002 & 24 October 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) *8-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 13-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claim 7 is objected to because of recitation "ethylbenzene". Suggested correction is -- ethyl benzene--.

2. Claim(s) 18-24 are objected to because of the following informalities: phrase "said oxidation chamber", claim 18 lines 17-18, is divided into two paragraphs (with "oxidation" being a last word of one paragraph and "chamber" a first word of next paragraph.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim(s) 1-7 and 13-24 is/are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "high temperature reaction" in claim(s) 1 and 18 (lines 1 and 2, respectively) is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. How high or low should the temperature of the reaction be to read on the claimed invention?

In claim 1, the recitation "increasing the temperature of the oxidant to a temperature resulting in the oxidant and fuel when mixed in the oxidation chamber being hotter than the autoignition temperature of said mixture of oxidant and fuel", lines 14-16, is not clear and renders said claim indefinite. Suggested correction is to replace said recitation with clearer

language of claim 18 --preheating said oxidant to a temperature at which when said oxidant and the fuel are mixed in said oxidation chamber, a temperature of said mixture of oxidant and fuel exceeds autoignition temperature of said mixture--.

Claim(s) 1 recite(s) the limitation(s)"the entire length" (line 7), "the temperature" (line 14), "the autoignition temperature" (line 16) and "the process" (line 19). There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 1 recite(s) the limitation(s) "fuel", line(s) 6, 10, 15, 16, 21 and 23. Said claim(s) is/are indefinite as it is not clear what is the difference between various fuels recited in said claim(s). Suggested correction is to replace "fuel" in line(s) 10, 15, 16, 21 and 23 with --the fuel--.

Claim(s) 1 recite(s) the limitation(s) "oxidant", line(s) 3-4, 16, 21 and 23. Said claim(s) is/are indefinite as it is not clear what is the difference between various oxidants recited in said claim(s). Suggested correction is to replace "oxidant" in line(s) 16, 21 and 23 with --the oxidant--.

Claim(s) 5 recite(s) the limitation(s) "the thermal cracking" and "the production of olefins". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 7 recite(s) the limitation(s) "the production of styrene" and "the dehydrogenation of ethylbenzene". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 7 recite(s) the limitation(s) "the vacuum flash distillation". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 18 recite(s) the limitation(s)"the entire length" (line 8), "the temperature" (line 14), "the autoignition temperature" (line 15), "the desired temperature" (line 19), "the heat flux" (line 20) and "the process" (line 21). There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 18 recite(s) the limitation(s) "fuel", line(s) 6, 9, 14 and 15. Said claim(s) is/are indefinite as it is not clear what is the difference between various fuels recited in said claim(s). Suggested correction is to replace "fuel" in line(s) 9, 14 and 15 with --said fuel--.

Claim(s) 18 recite(s) the limitation(s) "oxidant", line(s) 4, 10 and 15. Said claim(s) is/are indefinite as it is not clear what is the difference between various oxidants recited in said claim(s). Suggested correction is to replace "oxidant" in line(s) 10 and 15 with --said oxidant--.

Claim(s) 19 recite(s) the limitation(s) "the process". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 20 recite(s) the limitation(s) "the thermal cracking" and "the production of olefins". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 22 recite(s) the limitation(s) "the process", "the production of styrene" and "the dehydrogenation of ethyl benzene". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim(s) 23 recite(s) the limitation(s) "the process". There is insufficient antecedent basis for said limitation(s) in the claim(s).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim(s) 1-7, 13-16 and 18-23 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (EP 0 450 872).

Regarding claim(s) 1 and 18, Ruhl, in Fig. 4, disclose(s) a process heater comprising:

- an oxidation chamber (30) having an inlet (40) for oxidant, an outlet (54) for combustion products and a flow path (Fig. 4) between the inlet (40) and the outlet (54);
- a fuel conduit (60) for transporting a fuel to the oxidation chamber, the fuel conduit (60) containing a plurality of fuel nozzles (64) along the length of the oxidation chamber (30), each nozzle (64) providing fluid communication from within the fuel conduit (60) to the oxidation chamber (30), the fuel nozzles being spaced so that fuel is added to the oxidation chamber (30) at a rate that no flame results when the fuel is mixed with the oxidant flowing through the flow path in the oxidation chamber (Fig. 4);
- a preheater in fluid communication with the oxidation chamber inlet (P5/L41-46), the preheater capable of increasing the temperature of the oxidant to a temperature resulting in the oxidant and fuel when mixed in the oxidation chamber being hotter than the autoignition temperature of said mixture of oxidant and fuel (P5/L51-57); and
- a process chamber (20) in a heat exchange relationship to the oxidation chamber (Fig. 4), whereby a controllable heat flux is provided to the process chamber at a sufficiently high rate to complete the process being conducted therein, and the heat transferred from the oxidation chamber does not cause the temperature of the mixture of oxidant and fuel within the oxidation

chamber in the vicinity of each fuel nozzle to decrease below the autoignition temperature of said mixture of oxidant and fuel in the oxidation (P5/L51-57).

While Ruhl does not explicitly disclose said nozzles being distributed along substantially the entire length of the oxidation chamber, the reference discloses that said nozzles are distributed in the burner zone, for the purpose of controlling the temperature of reaction occurring in the process chamber (Fig. 4 and P5/L51-57), and that other methods of staged introduction of fuel into the oxidation chamber can also be employed. In view of this teaching, and in view of general knowledge available to one of ordinary skill in the art, that heat transfer to a process can be optimized by placing a heater in a location where heat is desired, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place said nozzles in any location where heat transfer to process in the process chamber is required, said locations including nozzles along substantially the entire length of the oxidation chamber, for the purpose of optimizing heat transfer to the process chamber. Further, the examiner notes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to add an additional nozzles to the fuel conduit, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

Regarding claim(s) 2-6, 13, 16, 19-21 and 23 Ruhl disclose(s) all of the claim limitations as set forth above. Additionally the reference discloses a heater further comprising:

- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor is supplied effective to inhibit coke formation at fuel conduit operating temperatures (P5/L8-10); wherein

- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 4);

- the oxidation chamber is essentially centrally located within the process chamber (Fig. 4);

- the process chamber is a pyrolysis chamber for thermal cracking of hydrocarbons in production of olefins (P3/L3-21);

- the process chamber contains a catalyst and is used for steam methane reforming (P3/L3-21); and

- the process chamber is used for an endothermic chemical reaction (P3/L3-210),

- wherein the endothermic chemical reaction is conducted in a single stage and heat is provided to the process chamber by the oxidation chamber at a controlled temperature profile (Fig. 4, P3/L3-210 and P5/L51-57).

Regarding claim(s)) 1-7, 13-16 and 18-23 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

7. Claim(s) 17 and 24 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (EP 0 450 872) in view of Minet et al. (USP 4,692,306).

Regarding claim 17 and 24, Ruhl discloses all of the claim limitations as set forth above, additionally the reference discloses that the oxidant can be preheated by any means known to one of ordinary skilled artisan (P5/L41-46), but the reference does not disclose that said oxidant is preheated by the effluent of the process chamber.

Minet et al. teaches a reaction chamber, wherein the reactants are preheated by the effluent of said reaction chamber (Fig. 1 and C5/L60-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the hot effluent of the process chamber of Ruhl to preheat the oxidant, as taught by Minet et al., for the purpose of optimizing the process operation by effluent using heat which is available in the process for the required oxidant preheating. In this way the operation cost can be lowered because no additional source of heat is needed to preheat said oxidant.

Regarding claim(s)) 17 and 24 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

8. Claim(s) 1-7, 13-16 and 18-23 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (EP 0 450 872) in view of Mikus (USP 5,255,742).

Regarding claim(s) 1 and 18, Ruhl, in Fig. 1, disclose(s) a process heater comprising:

- an oxidation chamber (30) having an inlet (40) for oxidant , an outlet (54) for combustion products and a flow path (Fig. 1) between the inlet (40) and the outlet (54);
- a fuel conduit (34) capable of transporting a fuel mixture to a fuel nozzle (Fig. 1) within the oxidation chamber (30), said nozzle providing communication from within the fuel conduit (34) to the oxidation chamber (30);
- a preheater in communication with the oxidation chamber inlet (P5/L41-46); and
- a process chamber (20) in a heat exchange relationship to the oxidation chamber (30).

While Ruhl shows embodiments of his heater which operate without a flame (see Fig. 4), such operation is not disclosed with respect to Fig. 1.

Mikus, in Fig. 3, teaches a process heater comprising:

- an oxidation chamber (10) having an inlet for oxidant , an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 3);
- a fuel conduit (12) capable of transporting a fuel mixture to a plurality of fuel nozzles (13) within the oxidation chamber (10), each nozzle (13) providing communication from within the fuel conduit (12) to the oxidation chamber (10), with each nozzle (13) along the flow path between the inlet and the outlet; and
- a preheater in communication with the oxidation chamber inlet, the preheater capable of increasing the temperature of the oxidant to a temperature resulting in the combined oxidant and fuel from the fuel nozzle closest to the oxidation chamber inlet being hotter than the autoignition temperature of the combined oxidant and fuel from the fuel nozzle closet to the oxidation chamber inlet (C3/L25-30).

In said process heater preheating at least the air stream and then mixing the fuel gas into the combustion air in relatively small increments will result in the flameless combustion (C4/27-40). The absence of flame eliminates the flame as a radiant heat source and results in more even temperature distribution throughout the length of the burner (abstract). Further it eliminates the hot spots within the burner and structures surrounding the burner, which originate from the radiant heat transfer from the luminous portion of the flame. Said process heater not only optimizes the process operation but it is also less expensive than a process heater operating with flames because of less expensive materials of construction (C2/L4-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the heater in the apparatus of Ruhl with the heater of Mikus for the purpose of providing more even temperature distribution throughout the length of the burner and lowering the costs of said apparatus.

While Mikus does not explicitly disclose said nozzles being distributed along substantially the entire length of the oxidation chamber, the reference discloses that said nozzles are distributed along the entire area where the process is occurring and where the heat transfer is desired (Fig. 3). In view of this teaching, and in view of general knowledge available to one of ordinary skill in the art, that heat transfer to a process can be optimized by placing a heater in a location where heat is desired, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place said nozzles in any location where heat transfer to process in the process chamber is required, said locations including nozzles along substantially the entire length of the oxidation chamber, for the purpose of optimizing heat transfer to the process chamber. Further, the examiner notes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to add an additional nozzles to the fuel conduit, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

Regarding claim(s) 2-4, Ruhl in view of Mikus disclose(s) all of the claim limitations as set forth above. Additionally Mikus discloses a heater further comprising:

- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor supplied can be effective to inhibit coke formation at fuel conduit operating temperatures (C6/L25-35); wherein

- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 3); and

- the oxidation reaction chamber is essentially centrally located within the process chamber (Fig. 3).

Regarding claim(s) 5-6, 13, 16, 19-21 and 23, Ruhl in view of Mikus disclose(s) all of the claim limitations as set forth above. Additionally Ruhl discloses a heater further comprising:

- the process chamber is a pyrolysis chamber for thermal cracking of hydrocarbons in production of olefins (P3/L3-21);

- the process chamber contains a catalyst and is used for steam methane reforming (P3/L3-21); and

- the process chamber is used for an endothermic chemical reaction (P3/L3-210),

- wherein the endothermic chemical reaction is conducted in a single stage and heat is provided to the process chamber by the oxidation chamber at a controlled temperature profile (Fig. 4, P3/L3-210 and P5/L51-57).

Regarding claim(s)) 1-7, 13-16 and 18-23 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

9. Claim(s) 17 and 24 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (EP 0 450 872) in view of Mikus (USP 5,255,742) and further in view of Minet et al. (USP 4,692,306).

Regarding claim 17 and 24, Ruhl in view of Mikus disclose all of the claim limitations as set forth above, additionally the reference discloses that the oxidant can be preheated by any means known to one of ordinary skilled artisan (P5/L41-46), but the reference does not disclose that said oxidant is preheated by the effluent of the process chamber.

Minet et al. teaches a reaction chamber, wherein the reactants are preheated by the effluent of said reaction chamber (Fig. 1 and C5/L60-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the hot effluent of the process chamber of Ruhl to preheat the oxidant, as taught by Minet et al., for the purpose of optimizing the process operation by effluent using heat which is available in the process for the required oxidant preheating. In this way the operation cost can be lowered because no additional source of heat is needed to preheat said oxidant.

Regarding claim(s)) 17 and 24 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Response to Arguments

10. Applicant's arguments filed on 26 August 2002 and 24 October 2002 have been fully considered but are moot in view of the new ground(s) of rejection.

11. The applicant argues and provides a declaration by Mikus that it would not have been obvious to use a heater of Mikus in any process other than heating of subterranean formations because of said heater only produces low heat flux. Said arguments and declaration are found unpersuasive. It is examiners position that, since there is a multitude of variables which can be

adjusted in any heater operation to change heat flux of said heater, said variables including the flow rates of gases being burned, composition of fuel being burned, the tube design (materials of construction, length and diameter), heat transfer properties of material being heated, number of heaters, etc., it would have been obvious to one of ordinary skill in the art at the time the invention was made to use flameless heater of Mikus in any process which requires uniform heat transfer, such a process of Ruhl, and if necessary to modify operation of said heater, possible by varying some of the above mentioned variables, to provide whatever heat is required by said process. This is suggested by the reference of Ruhl itself, which teaches that the apparatus can incorporate as many heater tubes as necessary to provide heat required by the process (see P5/L36-40) and that temperature of combustion gases, and inherently heat flux of the heater, can be varied by adjusting the fuel composition and flow rates of fuel and air (see P7/L4-7). The applicant has not provided any data showing that increasing number of heaters of Mikus in the process of Ruhl would not provide heat sufficient to operate said process. In this regard, mere arguments and conclusory statements, which are unsupported by factual evidence, are entitled to little probative value. *In re Linder*, 457 F.2d 506, 508-09, 173 USPQ 356, 358 (CCPA 1972); *In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984); *In re Wood*, 582 F.2d 638, 642, 199 USPQ 137, 140 (CCPA 1978).

Conclusion

12. In view of the foregoing, none of the claims are allowed.

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Basia Ridley, whose telephone number is (703) 305-5418. The examiner can normally be reached on Monday through Thursday, from 8:30 AM to 7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola, can be reached on (703) 308-6824.

The fax phone number for Group 1700 is (703) 872-9311 (for Official papers after Final), (703) 872-9310 (for other Official papers) and (703) 305-6078 (for Unofficial papers). When filing a fax in Group 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are not for entry into the file of the application. This will expedite processing of your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Basia Ridley
Examiner
Art Unit 1764

BR
December 30, 2002

Hien Tran

HIEN TRAN
PRIMARY EXAMINER